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09/863,025	05/23/2001	Jonathan Martin Shekter	1952098-0003	7273

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EXAMINER	
EDWARDS, PATRICK L	

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 09/863,025	Applicant(s) SHEKTER, JONATHAN MARTIN	
	Examiner Patrick L Edwards	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08-10-2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6-16,18-29,31-42 and 44-52* is/are rejected.

7)☒ Claim(s) *17,30,43 and 53* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *05-21-2002*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Invention I in the reply filed on July 7, 2004 is acknowledged. The traversal is on the ground(s) that there will be no significant additional burden to the examiner in conducting a search including the various subclasses for each of the inventions. This is not found persuasive because the inventions are distinct subcombinations and have acquired separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

The requirement is still deemed proper and is therefore made FINAL.

Claim Objections

2. Claim 40 is objected to because of the following informalities:

--the claim recites a "menu pixel". This should be changed to read "mean pixel".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 6-53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regard to claims 10, 25, and 35, the metes and bounds of the term "about 16 to 32 pixels square" are not clear.

With regard to claims 13, 27, and 38, the metes and bounds of the term "about 5 to 10 regions" are not clear.

With regard to claims 6 and 39, the metes and bounds of the term "about 7 regions" are not clear.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 6, 23, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaplan et al. (USPN 5,594,816) in view of May et al. (USPN 5,844,627)

With regard to claim 6, Kaplan discloses identifying regions of approximately constant pixel value within a digital image (Kaplan col. 2 lines 20-30 with Figures 2-7: The reference describes selecting a pixel neighborhood. It is well known in the art that spatial proximity in pixels implies approximately constant values of those pixels. This is explicitly stated in Silverbrook et al. (USPN 6,366,693) at column 3 lines 16-27. The Silverbrook reference is merely provided for explanatory purposes. Specifically, the Silverbrook reference shows that the pixel neighborhoods of Kaplan are sufficient to meet the claimed limitation of 'approximately constant pixel values').

Kaplan further discloses selecting a predetermined number of identified regions based on pixel value variances within each region (Kaplan col. 4 lines 26-33: The reference describes computing a value X^2 for each neighborhood. This value is based on pixel value variances within each identified region (see Kaplan equation (1) on col. 2 lines 60-63). If this value exceeds a threshold, then the the neighborhood is not smoothed (i.e. the region is not selected), whereas if this value is below the thresold then it is smoothed (i.e. the region is selected). The number of identified regions which are selected are predetermined based on a given image and a given thresold value).

As was stated above, the selection of the image regions in the Kaplan disclosure determines whether or not the neighborhood undergoes a filtering operation. These selected image regions are not analyzed to generate a mathematical model of image noise as recited in the claim. The Kaplan reference, therefore, is deficient in this respect.

The May reference, however, selects an image region based on the pixel value variances (May col. 3 lines 15-19), and then analyzes the selected region to generate a mathematical model of the image noise (May col. 3 lines 23-24: The reference describes determining the global noise signal variance, which qualifies as a 'mathematical model of noise' as recited in the claim. It would have been obvious to one reasonably skilled in the art at the time of the invention to modify kaplan's noise removal method by determining a mathematical model of noise as taught by May. Such a modification would have increased the adaptability of a noise filtering operation by modeling the noise before applying the noise filter, and therefore determining the necessary amount of noise filtering to be applied (May col. 3 lines 33-34).

With regard to claims 23 and 32, Kaplan inherently discloses a computer readable medium that contains computer executable instructions.

7. Claims 7-10, 12, 23-25, 32-35, 37, 48, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kaplan and May as applied in claims 6, 23, and 32 above, and further in view of Miyano (USPN 6,727,942). The arguments as to the relevance of Kaplan and May as applied above are incorporated herein.

With regard to claim 7, which is representative of independent claim 48, Kaplan further discloses defining a plurality of regions in the digital image (kaplan col. 2 lines 21-24)..

Kaplan further discloses 'discarding' some of the defined regions to generate a set of remaining regions (Kaplan col. 4 lines 26-35: The reference describes not smoothing the regions which exceed a threshold value. Therefore, these regions are 'discarded' from the smoothing operation.).

Kaplan further discloses determining pixel value variations among the remaining pixel regions, and identifying the remaining regions with lower variation (kaplan col. 4 lines 41-43: The reference describes keeping the regions with the lower of the variable X^2, which is indicative of region variation).

Although Kaplan discloses 'discarding' some of the defined regions, Kaplan fails to expressly disclose that these regions are discarded because they contain pixel value which are saturated or clipped.

Miyano, however, discloses discarding image blocks (or regions) because they contain saturated pixel values (Miyano col. 3 lines 39-44). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Kaplan and May's noise analyzing method by discarding image regions which contain saturated pixels as taught by Miyano. Such a modification would have allowed for a more meaningful noise model that only took representative regions into account, and therefore calculated a more accurate noise model (Miyano col. 3 lines 39-44).

Referring to claims 8 and 12, kaplan discloses that a region size is "selected" (kaplan col. 5 line 47). Kaplan does not expressly disclose whether this selection is performed automatically, or by a user. May, however, expressly discloses user selection of image regions (May col. 3 lines 40-41). It would have been obvious to one reasonably skilled in the art at the time of the invention to allow the image regions to be selected by a user as taught by May. Such a modification would have allowed for the user to identify regions of approximate pixel value. This added feature would have made for a more robust and flexible method.

Referring to claims 9 and 49, Kaplan discloses setting a region size for each of said plurality of regions (Kaplan col. 2 line 48).

Kaplan further discloses using a random sampling pattern such that the regions include all of the image pixels (see figure 9 of kaplan).

Referring to claims 10 and 49 Kaplan discloses a region that is 21 pixels square (kaplan col. 2 lines 48).

Referring to claims 18, 20, and 44, and 46 Miyano discloses that the pixel values are vectors that include multiple channels that are analyzed independently and simultaneously (Miyano col. 17 lines 30-34).

Referring to claims 19 and 45, Miyano discloses uncorrelating the R, G, and B channels with a color filter (Miyano col. 18 lines 43-45)

Referring to claims 22 and 47, Miyano discloses performing a transformation from R, G, and B data channels to a brightness channel. Since the output pixel is a color image represented by R, G, and B channels, we can say that this transformation is homomorphic, because the transformation is reverseable (Miyano col. 6 lines 27-37, and col. 27 lines 42-47).

With regard to claims 23-25, 31-35, 37, 44, and 46 all of the limitations of these claims have been addressed above. Kaplan inherently discloses a computer readable medium that contains computer executable instructions.

8. Claims 11, 13, 14, 26, 27, 36, 38, 39, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kaplan, May, and Miyano as applied above, and further in view of Gindele (USPN 6,681,054). The arguments as to the relevance of the aforesaid combination as applied above are incorporated herein.

Referring to claim 11, Miyano discloses discarding regions in which pixels are saturated or clipped, but fails to expressly recite that this process involves comparing the average value of a region against the overall average of the image, and discarding those regions whose average value differs from the overall average by more than a standard deviation. The miyano reference discloses the difference operation, but does not expressly recite that the difference must be greater than one standard deviation. Gindele, however, discloses comparing a pixel difference operation with a standard deviation, and discarding those subtraction results that are greater than this value (Gindele col. 9 lines 65-67: The reference shows that the weighting value goes to zero in this situation. Hence, the region is discarded). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the miyano reference by using the standard deviation as the region discarding threshold as taught by Gindele. Such a modification would have allowed for a system which employed a well known statistical technique for ease of computation and reliability of results.

Referring to claims 13, 14, 39, and 50, Kaplan discloses identifying regions of an image, but fails to expressly disclose the number of regions which are identified. Gindele, however, discloses using 8 local regions (Gindele col. 7 lines 25-31). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify kaplan's image region identification method by identifying 8 regions as taught by Gindele. Such a modification would have allowed for a manageable system that did not require an excessive number of computations.

Please note that the examiner is interpreting the 8 local regions above as sufficient to meet the claimed limitation of 'about 7 regions'.

Referring to claims 26, 27, 36, and 38, a computer readable medium that contains computer executable instructions is inherent in the kaplan reference.

9. Claims 15, 16, 21, 28, 40, 51, and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kaplan, May and Miyano as applied above, and further in view of Kokaram (USPN 5,500,685). The arguments as to the relevance of the aforesaid combination as applied above are incorporated herein.

Referring to claim 15, which is representative of claim 51, May discloses determining a noise component by subtracting a mean value from a pixel value (May col. 3 lines 49-54: The reference describes a wiener filter, which is well known in the art to determine the noise signal by subtracting the mean value from a pixel value.).

May further discloses determining a mathematical model of the noise signal, but fails to expressly disclose analyzing the PSD of the noise, and then generating a parametric model of the noise based on the PSD. Kokaram, however, discloses estimating the PSD of the noise (Kokaram col. 8 lines 60-61, and col. 11 lines 15-26). The kokaram reference also discloses that the noise PSD is a parameter (Kokaram col. 8 line 64). Hence, it is part of a parametric model.

Referring to claim 16, which is representative of claim 52, Kokaram further discloses that the PSD analysis comprises applying an autocorrelation function to the noise, and then applying a discrete fourier transform to the autocorrelation function (Kokaram col. 7 lines 40-55).

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the May's noise modeling method by determining the PSD of the noise as taught by Kokaram. Such a modification would have allowed for a method of calculating a model of the power of the noise in an image. Calculating this term allows for more precision in a subsequent filtering operation (Kokaram col. 2 lines 51-60)

Referring to claim 21, Kokaram further discloses that the digital image comprises a plurality of frames and each frame is analyzed independently and simultaneously (Kokaram col. 2 lines 10-20). It would have been obvious to one reasonably skilled in the art at the time of the invention to analyze the noise of multiple frame image data. Such a modification would have allowed for a method that was robust to video noise removal.

Allowable Subject Matter

10. Claims 17, 30, 43, and 53 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and ALL intervening claims.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Reuman (USPN 6,069,982) teaches estimation of spatial noise characteristics
- Gray et al. (USPN 5,641,596) uses spatial image statistics in image filtering
- Seeger et al. (USPN 6,577,762) determines image region variance for background thresholding
- Okamoto (USPN 5,548,659) computes noise modeling parameters in dynamic images
- Sillart (USPN 5,033,103) determines variations in image regions to suppress noise and enhance images
- Gallagher et al. (USPN 6.804,408) enhances digital image channels based on local noise estimates

- Lee et al. (USPN 6,678,404) locates image objects by de-emphasizing regions with high variations
- Cheung et al. (USPN 6,631,206) employs correlation based pixel clustering in scene detection.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick L Edwards whose telephone number is (703) 305-6301. The examiner can normally be reached on 8:30am - 5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).,

Patrick Lynn Edwards
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Art Unit 2621

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